CLAIMS

What is claimed is:

1. A method for producing a resistive element comprising the steps of:

depositing a seed layer over a first electrode; and

depositing an insulating barrier layer over the seed layer wherein the barrier layer is thin enough to allow a tunneling current to flow to a second electrode; wherein the resistive element comprises a resistance that is a function of the thickness of the insulating barrier layer.

2. The method of claim 1 further comprising the step of depositing a smoothing layer of Ta over said first electrode prior to depositing said seed layer.

3. The method of claim 1 further comprising the step of oxidizing the insulating barrier layer.

4. The method of claim 1 further comprising the step of patterning the resistive element such that the resistive element has a predetermined resistance value.

5. The method of claim 1 wherein the step of depositing a seed layer over a first electrode further comprises depositing a seed layer of CoFe.

6. A method of producing a resistor for use in a semiconductor device, said method comprising:

depositing a base layer over a metal contact point;

depositing a seed layer over the base layer;

depositing a barrier layer over the seed layer; and

depositing a non-magnetic metal layer over the barrier layer.

7. The method of claim 6 further comprising the step of depositing a protective cap layer over the non-magnetic metal layer.

8. The method of claim 6 further comprising the step of patterning the resistor such that the resistor has a desired resistance value.

9. The method of claim 6 further comprising the step of oxidizing the barrier layer.

10. The method of claim 9 wherein the barrier layer is oxidized with an oxygen plasma.

11. The method of claim 6 wherein the step of depositing a seed layer over of the base layer comprises depositing a seed layer of CoFe over the base layer.

12. The method of claim 6 wherein the step of depositing a base layer over a metal contact point comprises depositing a base layer containing Ta over a metal contact point.

13. The method of claim 6 wherein the step of depositing a barrier layer over the seed layer comprises depositing a barrier layer of Al over the seed layer.

14. The method of claim 6 wherein the step of depositing a non-magnetic metal layer over the barrier layer comprises depositing a layer of Al over the barrier layer.

15. The method of claim 6 wherein the step of depositing a barrier layer over the seed layer comprises depositing a barrier layer less than approximately 2 nanometers thick over the seed layer.

16. The method of claim 6 further comprising depositing a smoothing layer of Ta over said base layer.

17. A resistive element for use in a semiconductor device, said resistive element comprising:

a base layer positioned over a metal contact;

a seed layer positioned over the base layer;

a barrier layer positioned over the seed layer; and

a non-magnetic metal layer positioned over the barrier layer.

18. The resistive element of claim 17 further comprising a protective cap layer positioned over the non-magnetic metal layer.

19. The resistive element of claim 17 wherein the barrier layer has been at least partially oxidized.

20. The resistive element of claim 17 further comprising a smoothing layer of Ta positioned over said base layer.

21. The resistive element of claim 17 wherein the base layer further comprises TaN.

22. The resistive element of claim 17 wherein said seed layer further comprises CoFe.

23. The resistive element of claim 17 wherein said non-magnetic metal layer further comprises Al.

24. A resistor comprising:

a top electrode formed from one of a magnetic and non-magnetic metal;

a bottom electrode formed of a non-magnetic metal; and

an insulating layer positioned between said bottom electrode and said top electrode wherein said insulating layer is thin enough to allow a tunneling current to be established between said top electrode and said bottom electrode.

25. The resistor of claim 24 wherein said insulating layer further comprises a thin layer of oxidized Al.

26. The resistor of claim 24 wherein said insulating layer further comprises a seed layer of CoFe.

27. The resistor of claim 24 further comprising a smoothing layer of Ta upon which said insulating layer is deposited.

28. The resistor of claim 24 wherein said bottom electrode comprises TaN.

29. The resistor of claim 24 wherein said top electrode further comprises at least one of Al and TaN.

30. The resistor of claim 24 wherein said insulating layer is less than approximately 2 nanometers in thickness.